



Case report

Citric acid treatment of post operative wound infections in HIV/AIDS patients



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KEYWORDS

Post operative wounds;
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Abstract The normal cellular immunity is required for normal wound healing. The HIV infection affects wound healing adversely. Wound infections in HIV/AIDS patients are difficult to manage because of compromised immunity. The result is delayed wound healing and increased susceptibility to wound infection. Here we report two cases of HIV positive patients who had developed the post operative wound gape, not responding to the conventional treatment, treated simply by local application of three percent citric acid ointment.

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Introduction

Impaired immune functions in HIV/AIDS patients increase the risk of perioperative infections, post-operative complications, impaired wound healing and associated with greater morbidity. Studies suggest that in these patients the risk of wound infection increases as the immune status deteriorates, hence these individuals have an

increased incidence of a variety of bacterial infections, significantly greater incidence of wound complications and poor and delayed wound healing [1–3]. A significantly greater incidence of wound complications and wound breakdown in the HIV group following laparotomy than in the non-HIV control group was observed [4]. Surgical site infection (SSI) continues to be an important cause of morbidity and mortality in developing countries despite recent advances in antiretroviral therapy and aseptic techniques. The progressive failure of the immune system in patients with HIV/AIDS can increase the possibility of developing surgical site infections after surgery. Studies have shown that

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patients with pre-morbid illnesses, such as diabetes mellitus, HIV/AIDS, hemophilia, etc. are at higher risk of developing SSI due to their compromised immunity.

The incidence rate of SSIs in HIV-infected patients undergoing abdominal operation has been reported to be 37.9% [5]. However, an incidence rate of 30% was found in diabetic patients undergoing spinal surgeries [6]. In another study carried out in Tanzania, 22.8% patients with SSIs had pre-morbid illnesses namely diabetes mellitus (7.2%), hypertension (14.8%) and HIV (14.8%). The SSI rates for patients with pre-morbidity and those without were 70.2% and 38.4% respectively (p -value = 0.002) [7]. Morbidity and mortality increase significantly when the CD_4^+ T-lymphocyte count is less than 200 cells/ μ L. Studies suggest that in such patients the risk of wound infection increases as the immune status decreases [7–9]. The post-operative wounds are practically difficult to manage because of deterioration in immunity level as indicated by the fall in the T-helper (CD_4) cell count.

The use of 3% citric acid ointment has been reported to give excellent results in the effective treatment of chronic wound infections in patients with various underlying diseases such as diabetes, burns, cancer, leprosy, etc. in earlier studies [10–13]. Based on these earlier findings, an attempt was made to use this simple and effective treatment modality for treating two cases of HIV positive patients who had developed the post operative wound gape and were not responding to the conventional treatment.

Here we report treatment of post operative wound gape in two cases of HIV positive patients by using local application of three percent citric acid ointment. The study protocol was approved by institutional ethical committee.

Case 1

A 24-year-old female, presented as a primigravida with history of nine and half months amenorrhea (41weeks + 5 days gestational age) and pre-eclampsia with cephalopelvic disproportion (CPD). Emergency lower segment caesarean section (LSCS) was done for CPD. She had regular menstrual cycles in the past. She got married first in 2005, her husband died within six months due to cancer, record not available. She got remarried in 2009. There was no past history of hypertension, diabetes mellitus and tuberculosis. On general examination, her general condition was fair, she was afebrile, pulse rate 90 per minute and blood pressure 146/96 mm of Hg. Systemic examination

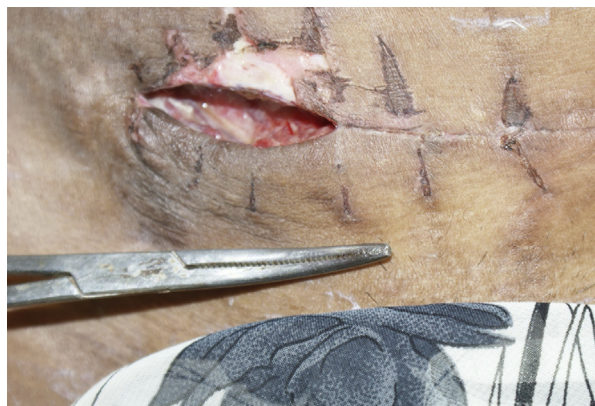


Figure 1 Post operative wound gape in HIV positive patient – before application of citric acid ointment.

showed normal respiratory and cardiovascular findings. Per abdominal examination showed full term uterus with fixed head and fetal heart sound was 140 per minute. Per vaginal examination showed cervix dilated by 3 cm (2 fingers loose), effacement 30–40%, membranes positive and pelvis borderline. On investigation, she was found to be HIV positive, confirmed by using three different screening tests. When first rapid test was positive on first sample, another sample was collected and processed by two other rapid tests. Both the blood samples were positive by three different rapid tests. The results of blood investigations were Hb-8.2 gm% and total leukocyte count – 13,000/ mm^3 and platelet count – 3.54 lakhs. Urine routine examination showed albumin positive and sugar nil. In urine microscopy nothing abnormal was detected. Liver function tests and kidney function tests were within normal limit, random blood sugar level was 78 mg%, peripheral smear for malarial parasite was negative, hepatitis B surface antigen negative and her CD_4 count was 160/ μ L. The ultrasonography findings showed single live intrauterine fetus. Chest radiograph was normal and sputum for acid fast bacilli was negative. An emergency LSCS was done for CPD and preeclampsia. Post operatively she was given intravenous injections of cefotaxime 1 gm BID and injection metronidazole 400 mg TID for seven days. On post operative day 8, stitches were removed and a wound gape of about 5 cm was seen (Fig. 1). A specimen of pus was collected and sent for culture and susceptibility studies and capsule amplus (ampicillin 500 mg + clavulanic acid 1.25 mg) TID orally was started along with cefotaxime and metronidazole, and local wound care with hydrogen peroxide and betadine. This treatment was continued for five more days but in vain. The pus culture yielded *Escherichia coli* resistant to amikacin, levofloxacin, ciprofloxacin,

cefoperazone, ceftazidime, gentamicin, gatifloxacin and, susceptible to meropenem and imipenem.

Considering no response to this conventional therapy, a decision of application of three percent citric acid ointment was taken with the consent of patient. The citric acid ointment was prepared by mixing of 3 g of pure citric acid (obtained from Hi Media Lab. Pvt. Ltd., Mumbai) with 97 g of white soft paraffin (100% pure petroleum jelly); a hydrocarbon base not absorbed by skin was used as an inert vehicle for citric acid. The citric acid ointment was prepared by mechanical mixing in a mortar by taking all sterile precautions. Before application, the wound was irrigated with normal saline and the wound was filled completely with three percent citric acid ointment once daily for 19 days. The citric acid ointment was used alone without packing and wound was covered by sterile dressing pad, which was held in place by sticking tape. Wound healed completely in 19 applications (Fig. 2). No antibiotics were given during the course of this treatment modality. No any adverse effects were seen except for mild to moderate irritation for 4 to 5 min after application of three percent citric acid to open wound.

Case 2

A 28-year-old female presented as a second gravida with history of 2 months amenorrhea, per vaginal bleeding since one day and giddiness since morning. Her obstetric history revealed one full term normally delivered male child, four years old living healthy. She had regular menstrual cycles in the past. Her family history revealed death of husband because of pulmonary tuberculosis and HIV/AIDS. She was also on irregular anti-Koch's therapy for five and half months and developed resistance to same, and was



Figure 2 Post operative wound gape in HIV positive patient — after 19 applications of citric acid ointment.

not receiving any antiretroviral therapy. Her general examination showed moderate general condition, she was afebrile with pulse rate 100 per minute and blood pressure 90/50 mm of Hg. Her systemic examination revealed normal respiratory and cardiovascular findings. Per abdominal examination revealed guarding rigidity present in lower abdomen and dullness in the flanks. Per speculum examination showed healthy but pale cervix and vagina. Per vaginal examination showed retroverted uterus and fullness in the fornices. Colpopuncture was positive for hemoperitonium. The case was diagnosed as 2nd gravida with acute ruptured ectopic pregnancy. On investigation, she was found to be HIV positive — confirmed by three different screening tests. Her differential leucocytes counts were N- 83.7%, L — 13.2%, M — 3%, and Hb — 9.6 gm/dl and total leukocyte count — 20, 500/mm³. The CD₄ count was 180/μL. She was posted for emergency laparotomy. The ruptured tube with ovary was removed and sutured. Peritoneal cavity cleaned and after checking for hemostasis, abdomen was closed in layers. Post operatively, she was given injection cefotaxime 1 gm BID and injection metronidazole 400 mg TID intravenously for seven days. Stitches were removed on the 8th day and pus discharge was noticed. A wound gape of about 2.5 cm was seen. A specimen of pus was collected and sent for culture and susceptibility studies. The culture of pus yielded *Pseudomonas aeruginosa* resistant to amikacin, levofloxacin, ciprofloxacin, cefoperazone, ceftazidime, gentamicin, gatifloxacin and meropenem, and susceptible to imipenem and *Staphylococcus aureus* resistant to penicillin, cotrimoxazole and gentamicin, and susceptible to levofloxacin, ciprofloxacin, erythromycin, clindamycin and chloramphenicol. Considering the presence of multiple antibiotic resistant *P. aeruginosa* and *S. aureus* in a wound, a decision of application of three percent citric acid ointment was taken with the consent of patient. Daily dressing with citric acid ointment was done for 8 days that resulted in complete healing of wound in 8 applications. No antibiotics were given during the course of this treatment modality. Follow up after 8 days showed a healthy dry scar. No any adverse effects were seen except for mild to moderate irritation for 4 to 5 min after application of three percent citric acid to open wound.

Discussion

The cellular and humoral immune responses are vital part of the mechanism of normal wound healing. Systemic immunodeficiency diseases such as HIV infection or the AIDS have been associated with

acute wound healing defects. As the normal cellular immunity is required for normal wound healing, the HIV infection affects adversely the acute wound healing [14]. Wound infections in HIV/AIDS patients increase discomfort, prolong hospital stay, render an additional burden upon an already debilitated patient and weaken the immune system further leading to delayed wound healing and increased susceptibility to wound infection [15].

Three percent citric acid ointment has been found effective in the treatment of a variety of chronic wound infections in patients with compromised immunity such as diabetes, burns, cancer, leprosy, etc. [10–13]. Based on the results in these immunocompromised individuals and histopathological observations [16], an attempt has been made to treat post operative wound infections in HIV/AIDS patients, which are otherwise very difficult to control, especially in the patients with CD_4^+ T-lymphocyte count less than 200 cells/ μ L. On the basis of prior experiences with citric acid treatment for such wounds not responding to conventional local therapy, we had started citric acid treatment. Initial improvement was observed within 7 days so it was continued for further till the complete healing occurred. Three percent citric acid was found highly effective in the treatment of post-operative wound infections caused by multiple antibiotic resistant *E. coli*, *S. aureus* and *P. aeruginosa* in HIV/AIDS patients with CD_4^+ T-lymphocyte count in the range of 160–180 cells/ μ L.

The studies show that an acidic environment created by use of acid helps in wound healing by controlling wound infection, increasing antimicrobial activity, altering protease activity, releasing oxygen, reducing toxicity of bacterial end products, enhancing epithelization and angiogenesis, etc. [17].

The microbiological studies and rapid clearing up of infected surfaces indicate that citric acid is antibacterial in nature. This antibacterial nature of citric acid may be attributed to lowering of pH that makes an environment unsuitable for growth and multiplication of bacteria. Citric acid keeps wound surface moist and reduces dehydration necrosis. Histological studies showed that citric acid enhances the healing process by boosting fibroblastic growth and neovascularization, which in turn increases microcirculation and enables the formation of healthy granulation tissue thereby leading to faster healing [16]. As a result of these actions, there is an increased migration of epithelial cells from surrounding skin, which enhances epithelialization acting as stimulus for laying of ground substances.

In spite of infection by multiple antibiotic resistant bacterial isolates and cellular immunodeficiency because of HIV/AIDS, post operative wound infections in HIV/AIDS patients were treated successfully simply by using three percent citric acid ointment.

Results indicate that this simple treatment modality is also effective in the management of post-operative wounds in HIV/AIDS patients and suggest that at a time when healing is a matter of great concern in HIV/AIDS patients, the value of citric acid as a topical agent should be considered as an alternative option.

Conflicts of interest

None to declare.

Source of funding

Nil.

Ethical approval

Approved by Institutional Ethical Committee.

Patient consent

Obtained.

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